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CLIENTS

FIG. 1

Row-ID	Name	Birth Year	Gender
0	Oscar	1959	M
1	André	1976	M
2	Ariane	1965	F
3	Laure	1976	F
4	Max	1947	M

POLICIES

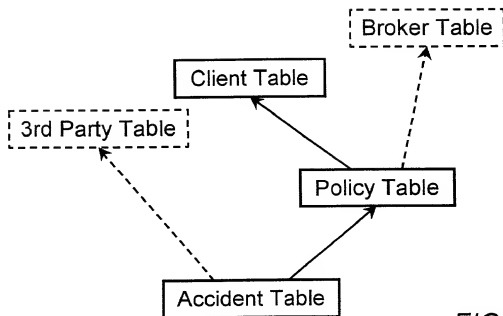
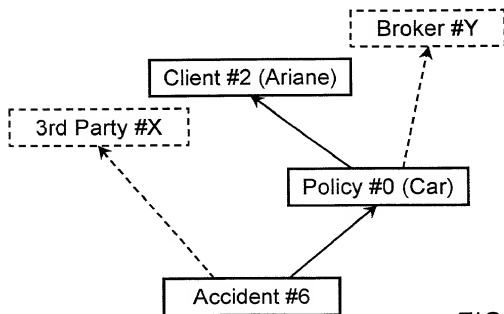
FIG. 2

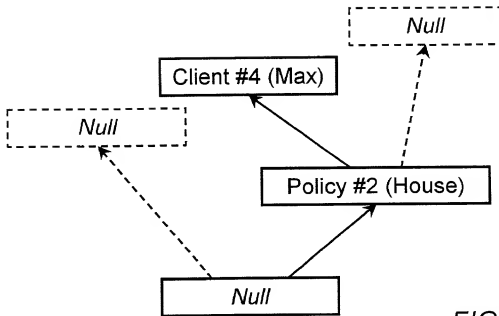
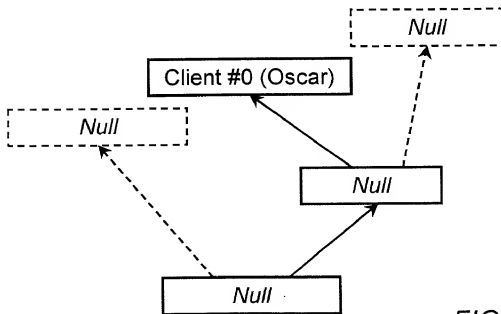
Row-ID	Type	Date	Client Link
0	Car	1998 06 24	2
1	Car	1998 09 09	1
2	House	1998 12 11	4
3	Car	1999 01 10	4
4	House	1999 01 31	2
5	Car	1999 02 01	3
6	House	1999 02 01	3

ACCIDENTS

FIG. 3

Row-ID	Date	Amount	Policy Link
0	1998 10 03	1 000	1
1	1999 04 18	10 000	4
2	1999 04 18	800	3
3	1999 06 12	1 300	1
4	1999 08 31	300	3
5	1999 12 08	2 200	5
6	1999 12 09	1 000	0
7	2000 02 25	6 000	4
8	2000 03 20	800	1

FIG. 4FIG. 5

FIG. 6FIG. 7

FLAT FILE

Row-ID	Client Name	Birth Year	Gender	Policy Type	Policy Date	Acc. Date	Amount
0	André	1976	M	Car	1998 09 09	1998 10 03	1 000
1	Ariane	1965	F	House	1999 01 31	1999 04 18	10 000
2	Max	1947	M	Car	1999 01 10	1999 04 18	800
3	André	1976	M	Car	1998 09 09	1999 06 12	1 300
4	Max	1947	M	Car	1999 01 10	1999 08 31	300
5	Laure	1976	F	Car	1999 02 01	1999 12 08	2 200
6	Ariane	1965	F	Car	1998 06 24	1999 12 09	1 000
7	Ariane	1965	F	House	1999 01 31	2000 02 25	6 000
8	André	1976	M	Car	1998 09 09	2000 03 20	800
9	Max	1947	M	House	1998 12 11	Null	Null
10	Laure	1976	F	House	1999 02 01	Null	Null
11	Oscar	1959	M	Null	Null	Null	Null

FIG. 8

LINK TABLE

FF Row-ID	Client Link	Policy Link	Accident Link
0	1	1	0
1	2	4	1
2	4	3	2
3	1	1	3
4	4	3	4
5	3	5	5
6	2	0	6
7	2	4	7
8	1	1	8
9	4	2	-1
10	3	6	-1
11	0	-1	-1

FIG. 9ACCIDENT AMOUNT (TRUNCATION LENGTH 3) THESAURUS

Amount Prefix	FF Row-ID List	Bitmap
0	{2,4,8}	001010001000
1	{0,3,6}	000100100000
2	{5}	000001000000
6	{7}	000000010000
10	{1}	010000000000

FIG. 10H

CLIENT NAME THESAURUS

	Name	FF Row-ID List	Bitmap
0	<i>Null</i>	-	000000000000
1	André	{0,3,8}	100100001000
2	Ariane	{1,6,7}	010000110000
3	Laure	{5,10}	000001000010
4	Max	{2,4,9}	001010000100
5	Oscar	{11}	000000000001

FIG. 10ACLIENT BIRTH YEAR THESAURUS

	Birth Year	FF Row-ID List	Bitmap
0	<i>Null</i>	-	000000000000
1	1947	{2,4,9}	001010000100
2	1959	{11}	000000000001
3	1965	{1,6,7}	010000110000
4	1976	{0,3,5,8,10}	100101001010

FIG. 10BCLIENT GENDER THESAURUS

	Gender	FF Row-ID List	Bitmap
0	<i>Null</i>	-	000000000000
1	F	{1,5,6,7,10}	010001110010
2	M	{0,2,3,4,8,9,11}	101110001101

FIG. 10C

POLICY TYPE THESAURUS

	Type	FF Row-ID List	Bitmap
0	<i>Null</i>	{11}	000000000001
1	Car	{0,2,3,4,5,6,8}	101111101000
2	House	{1,7,9,10}	010000010110

FIG. 10DPOLICY DATE THESAURUS

	Date	FF Row-ID List	Bitmap
0	<i>Null</i>	{11}	000000000001
1	1998 06 24	{6}	000000100000
2	1998 09 09	{0,3,8}	100100001000
3	1998 12 11	{9}	000000000100
4	1999 01 10	{2,4}	001010000000
5	1999 01 31	{1,7}	010000010000
6	1999 02 01	{5,10}	000001000010

FIG. 10E

ACCIDENT DATE THESAURUS

	Date	FF Row-ID List	Bitmap
0	<i>Null</i>	{9,10,11}	000000000111
1	1998 10 03	{0}	100000000000
2	1999 04 18	{1,2}	010000000000
3	1999 06 12	{3}	000100000000
4	1999 08 31	{4}	000010000000
5	1999 12 08	{5}	000001000000
6	1999 12 09	{6}	000000100000
7	2000 02 25	{7}	000000010000
8	2000 03 20	{8}	000000001000

FIG. 10FACCIDENT AMOUNT THESAURUS

	Amount	FF Row-ID List	Bitmap
0	<i>Null</i>	{9,10,11}	000000000111
1	300	{4}	000010000000
2	800	{2,8}	001000001000
3	1 000	{0,6}	100000100000
4	1 300	{3}	000100000000
5	2 200	{5}	000001000000
6	6 000	{7}	000000010000
7	10 000	{1}	010000000000

FIG. 10G

CLIENT NAME THESAURUS

Name	Bitmap	L1 Ranks	L1 Segments
Null	000 000 000 000	-	-
André	100 100 001 000	{0,1,2}	{100,100,001}
Ariane	010 000 110 000	{0,2}	{010,110}
Laure	000 001 000 010	{1,3}	{001,010}
Max	001 010 000 100	{0,2,3}	{001,010,100}
Oscar	000 000 000 001	{3}	{001}

FIG. 11AACCIDENT AMOUNT THESAURUS

Amount	Bitmap	L1 Ranks	L1 Segments
Null	000 000 000 111	{3}	{111}
300	000 010 000 000	{1}	{010}
800	001 000 001 000	{0,2}	{001,001}
1 000	100 000 100 000	{0,2}	{100,100}
1 300	000 100 000 000	{1}	{100}
2 200	000 001 000 000	{1}	{001}
6 000	000 000 010 000	{2}	{010}
10 000	010 000 000 000	{0}	{010}

FIG. 11GACCIDENT AMOUNT MACROWORD (/ 3) THESAURUS

Prefix	Bitmap	L1 Ranks	L1 Segments
0	001 010 001 000	{0,1,2}	{001,010,001}
1	000 100 100 000	{1,2}	{100,100}
2	000 001 000 000	{1}	{001}
6	000 000 010 000	{2}	{010}
10	010 000 000 000	{0}	{010}

FIG. 11H

CLIENT NAME THESAURUS

Name	L1 Ranks	L1 Bitmap	L2 Ranks	L2 Segments
Null	-	00 00	-	-
André	{0,1,2}	11 10	{0,1}	{11,10}
Ariane	{0,2}	10 10	{0,1}	{10,10}
Laure	{1,3}	01 01	{0,1}	{01,01}
Max	{0,2,3}	10 11	{0,1}	{10,11}
Oscar	{3}	00 01	{1}	{01}

FIG. 12AACCIDENT AMOUNT THESAURUS

Amount	L1 Ranks	L1 Bitmap	L2 Ranks	L2 Segments
Null	{3}	00 01	{1}	{01}
300	{1}	01 00	{0}	{01}
800	{0,2}	10 10	{0,1}	{10,10}
1 000	{0,2}	10 10	{0,1}	{10,10}
1 300	{1}	01 00	{0}	{01}
2 200	{1}	01 00	{0}	{01}
6 000	{2}	00 10	{1}	{10}
10 000	{0}	10 00	{0}	{10}

FIG. 12GACCIDENT AMOUNT MACROWORD (/ 3) THESAURUS

Prefix	L1 Ranks	L1 Bitmap	L2 Ranks	L2 Segments
0	{0,1,2}	11 10	{0,1}	{11,10}
1	{1,2}	01 10	{0,1}	{01,10}
2	{1}	01 00	{0}	{01}
6	{2}	00 10	{1}	{10}
10	{0}	10 00	{0}	{10}

FIG. 12H

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CLIENT NAME THESAURUS

Name	L1 Ranks	L1 Segments	L2 Ranks	L2 Segments
<i>Null</i>	-	-	-	-
André	{0,1,2}	{100,100,001}	{0,1}	{11,10}
Ariane	{0,2}	{010,110}	{0,1}	{10,10}
Laure	{1,3}	{001,010}	{0,1}	{01,01}
Max	{0,2,3}	{001,010,100}	{0,1}	{10,11}
Oscar	{3}	{001}	{1}	{01}

FIG. 13AACCIDENT AMOUNT THESAURUS

Amount	L1 Ranks	L1 Segments	L2 Ranks	L2 Segments
<i>Null</i>	{3}	{111}	{1}	{01}
300	{1}	{010}	{0}	{01}
800	{0,2}	{001,001}	{0,1}	{10,10}
1 000	{0,2}	{100,100}	{0,1}	{10,10}
1 300	{1}	{100}	{0}	{01}
2 200	{1}	{001}	{0}	{01}
6 000	{2}	{010}	{1}	{10}
10 000	{0}	{010}	{0}	{10}

FIG. 13GACCIDENT AMOUNT MACROWORD (/ 3) THESAURUS

Prefix	L1 Ranks	L1 Segments	L2 Ranks	L2 Segments
0	{0,1,2}	{001,010,001}	{0,1}	{11,10}
1	{1,2}	{100,100}	{0,1}	{01,10}
2	{1}	{001}	{0}	{01}
6	{2}	{010}	{1}	{10}
10	{0}	{010}	{0}	{10}

FIG. 13H

CLIENT NAME THESAURUS

Name	L1 First	L1 Last	L2 First
<i>Null</i>	0	0	0
André	20	2	3
Ariane	5	6	12
Laure	8	12	14
Max	29	15	6
Oscar	26	26	7

FIG. 14AACCIDENT AMOUNT THESAURUS

Amount	L1 First	L1 Last	L2 First
<i>Null</i>	13	13	21
300	4	4	22
800	9	10	16
1 000	3	19	18
1 300	24	24	20
2 200	25	25	4
6 000	23	23	9
10 000	16	16	10

FIG. 14GACCIDENT AMOUNT MACROWORD (/ 3) THESAURUS

Prefix	L1 First	L1 Last	L2 First
0	21	7	19
1	30	14	25
2	1	1	27
6	28	28	28
10	18	18	1

FIG. 14H

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Address L1 Rank Next L1 Segment

1	1	0	001
2	2	0	001
3	0	19	100
4	1	0	010
5	0	6	010
6	2	0	110
7	2	0	001
8	1	12	001
9	0	10	001
10	2	0	001
11	1	2	100
12	3	0	010
13	3	0	111
14	2	0	100
15	3	0	100
16	0	0	010
17	x	0	000
18	0	0	010
19	2	0	100
20	0	11	100
21	0	22	001
22	1	7	010
23	2	0	010
24	1	0	100
25	1	0	001
26	3	0	001
27	2	15	010
28	2	0	010
29	0	27	001
30	1	14	100
31	x	32	000
32	x	33	000
33	x	17	000

FIG. 15

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Address	L2 Rank	Next	L2 Segment
1	0	0	10
2	1	0	01
3	0	11	11
4	0	0	01
5	1	0	10
6	0	13	10
7	1	0	01
8	x	17	00
9	1	0	10
10	0	0	10
11	1	0	10
12	0	23	10
13	1	0	11
14	0	2	01
15	1	0	10
16	0	15	10
17	x	24	00
18	0	5	10
19	0	30	11
20	0	0	01
21	1	0	01
22	0	0	01
23	1	0	10
24	x	0	00
25	1	26	01
26	2	0	10
27	0	0	01
28	1	0	10
29	x	8	00
30	1	0	10

FIG. 16

CLIENT NAME THESAURUS

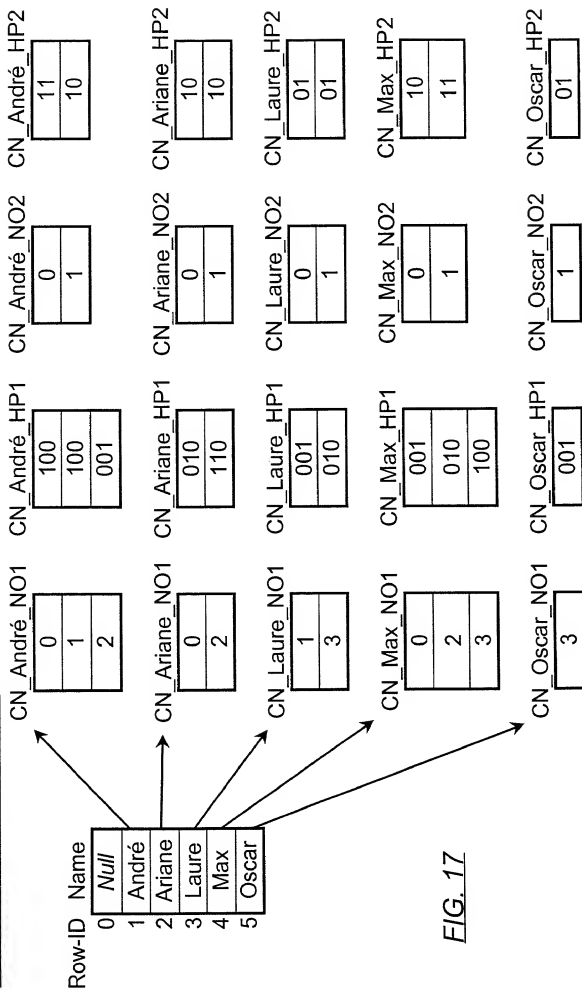
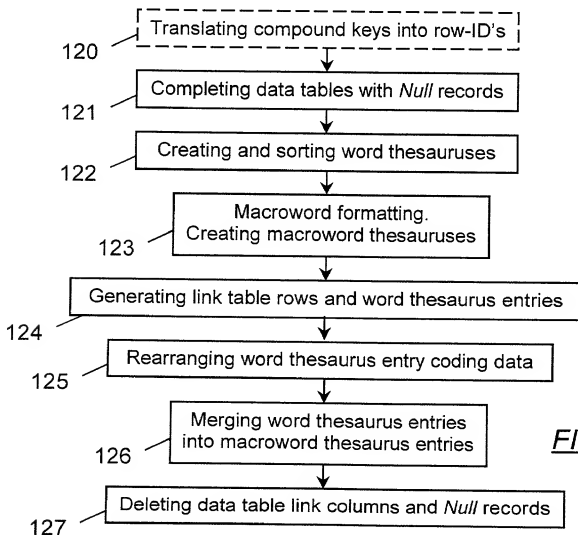
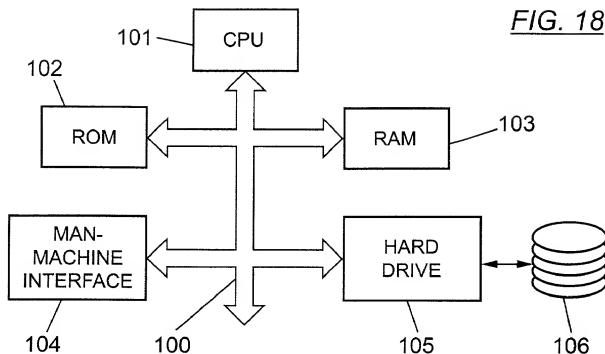
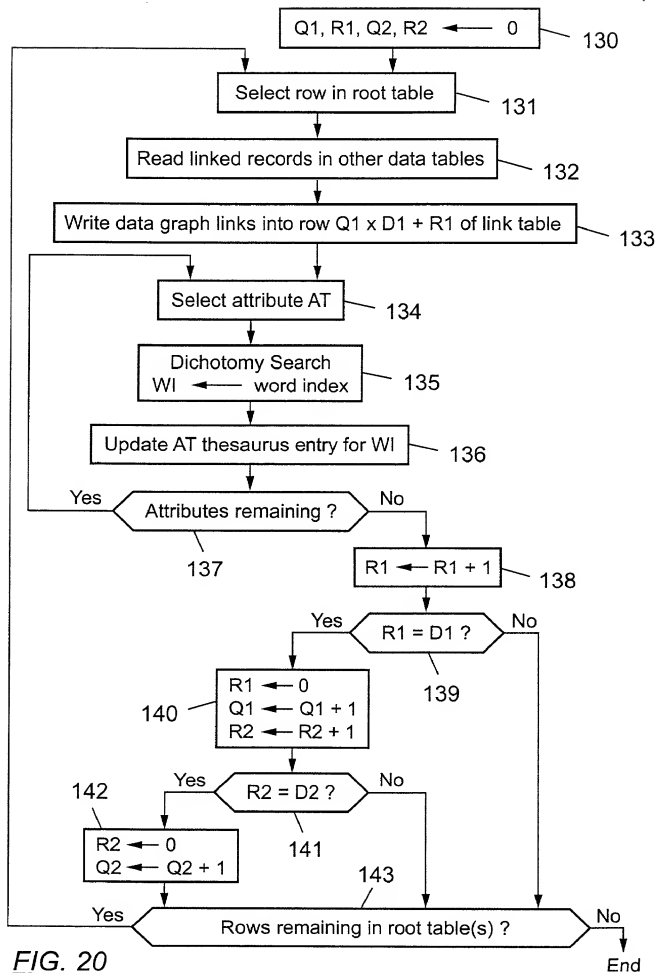


FIG. 17



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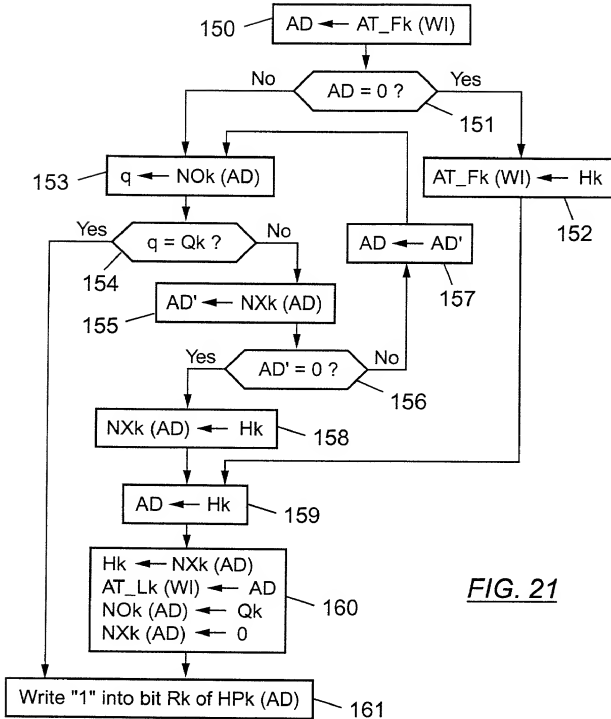


FIG. 21

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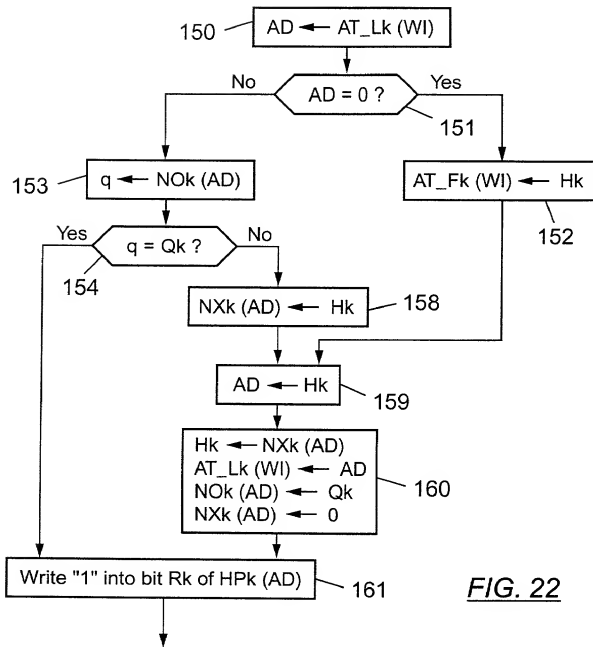


FIG. 22

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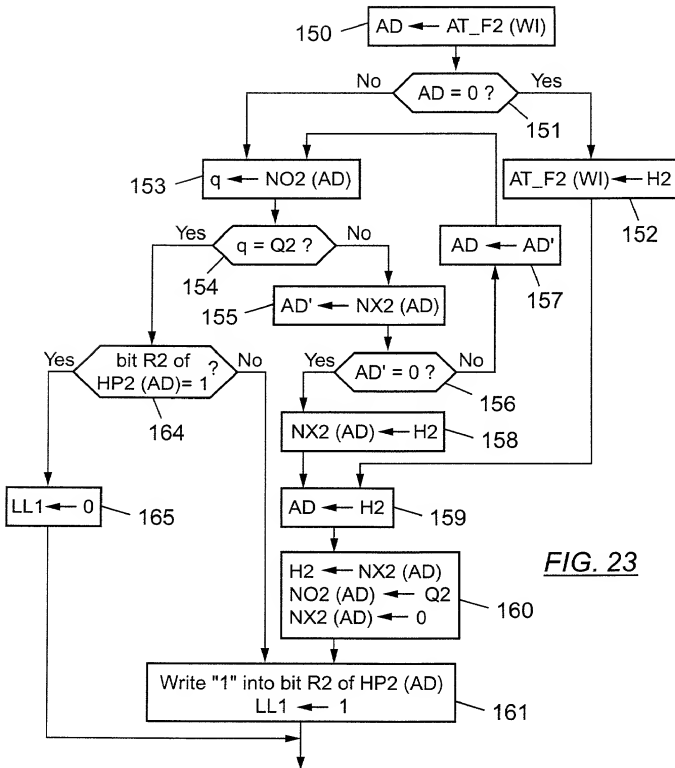


FIG. 23

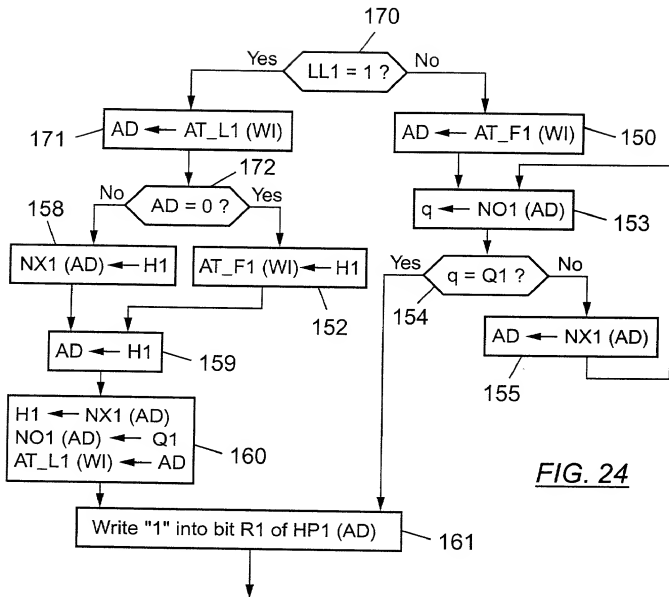


FIG. 24

CLIENT NAME THESAURUS

Row-ID	Name	Word Index	Format
0	Null	0	1
1	André	1	1
2	Ariane	2	1
3	Laure	3	1
4	Max	4	1
5	Oscar	5	1

FIG. 25ACCIDENT AMOUNT THESAURUS

Row-ID	Amount	Word Index	Format
0	Null	0	1
1	300	1	1
2	800	2	1
3	1 000	3	1
4	1 300	4	1
5	2 200	5	1
6	6 000	6	1
7	10 000	7	1

FIG. 26ACC. AMOUNT. MACROWORD (/3) THESAURUS

Row-ID	Prefix	Macro Index	First Word	Format
0	0	0	1	1
1	1	1	3	1
2	2	2	5	1
3	6	3	6	1
4	10	4	7	1

FIG. 27

CLIENT NAME AUXILIARY TABLE

Row-ID	CN_F1	CN_L1	CN_F2
0	0	0	0
1	1	3	1
2	4	5	3
3	6	7	5
4	8	10	7
5	11	11	9

FIG. 28ACCIDENT AMOUNT AUXILIARY TABLE

Row-ID	AA_F1	AA_L1	AA_F2
0	12	12	10
1	13	13	11
2	14	15	12
3	16	17	14
4	18	18	16
5	19	19	17
6	20	20	18
7	21	21	19

FIG. 29ACC. AMOUNT. MACROWORD (/ 3) AUXILIARY TABLE

Row-ID	AA_3_F1	AA_3_L1	AA_3_F2
0	22	24	20
1	25	26	22
2	27	27	24
3	28	28	25
4	29	29	26

FIG. 30

AD	NO1	NX1	HP1
1	0	2	100
2	1	3	100
3	2	0	001
4	0	5	010
5	2	0	110
6	1	7	001
7	3	0	010
8	0	9	001
9	2	10	010
10	3	0	100
11	3	0	001
12	3	0	111
13	1	0	010
14	0	15	001
15	2	0	001
16	0	17	100
17	2	0	100
18	1	0	100
19	1	0	001
20	2	0	010
21	0	0	010
22	0	23	001
23	1	24	010
24	2	0	001
25	1	26	100
26	2	0	100
27	1	0	001
28	2	0	010
29	0	0	010
30	x	31	000
31	x	32	000
32	x	33	000
33	x	0	000

FIG. 31

AD	NO2	NX2	HP2
1	0	2	11
2	1	0	10
3	0	4	10
4	1	0	10
5	0	6	01
6	1	0	01
7	0	8	10
8	1	0	11
9	1	0	01
10	1	0	01
11	0	0	01
12	0	13	10
13	1	0	10
14	0	15	10
15	1	16	10
16	0	17	01
17	0	18	01
18	1	19	10
19	0	20	10
20	0	21	11
21	1	0	10
22	0	23	01
23	1	0	10
24	0	0	01
25	1	0	10
26	0	0	10
27	x	28	00
28	x	29	00
29	x	30	00
30	x	0	00

FIG. 32

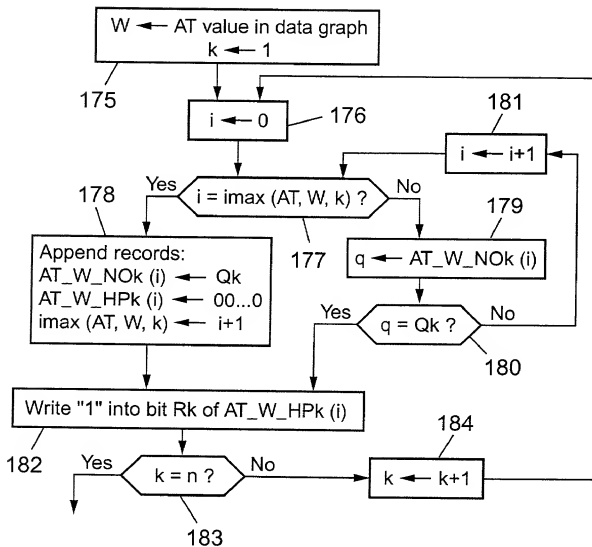


FIG. 33

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AD	NO2	NX2	HP2	F1
1	0	2	11	1
2	1	0	10	3
3	0	4	10	4
4	1	0	10	5
5	0	6	01	6
6	1	0	01	7
7	0	8	10	8
8	1	0	11	9
9	1	0	01	11
10	1	0	01	12
11	0	0	01	13
12	0	13	10	14
13	1	0	10	15
14	0	15	10	16
15	1	16	10	17
16	0	17	01	18
17	0	18	01	19
18	1	19	10	20
19	0	20	10	21
20	0	21	11	22
21	1	0	10	24
22	0	23	01	25
23	1	0	10	26
24	0	0	01	27
25	1	0	10	28
26	0	0	10	29
27	x	28	00	x
28	x	29	00	x
29	x	30	00	x
30	x	0	00	x

FIG. 34A

AD	NX1	HP1
1	2	100
2	0	100
3	0	001
4	0	010
5	0	110
6	0	001
7	0	010
8	0	001
9	10	010
10	0	100
11	0	001
12	0	111
13	0	010
14	0	001
15	0	001
16	0	100
17	0	100
18	0	100
19	0	001
20	0	010
21	0	010
22	23	001
23	0	010
24	0	001
25	0	100
26	0	100
27	0	001
28	0	010
29	0	010
30	31	000
31	32	000
32	33	000
33	0	000

FIG. 34B

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AD	NO2	NX2	F1
1	0	2	1
2	1	0	3
3	0	4	4
4	1	0	5
5	0	6	6
6	1	0	7
7	0	8	8
8	1	0	9
9	1	0	11
10	1	0	12
11	0	0	13
12	0	13	10
13	1	0	14
14	0	15	15
15	1	16	16
16	0	17	17
17	0	18	18
18	1	19	19
19	0	20	20
20	0	21	21
21	1	0	22
22	0	23	24
23	1	0	25
24	0	0	26
25	1	0	27
26	0	0	28
27	x	28	29
28	x	29	x
29	x	30	x
30	x	0	x

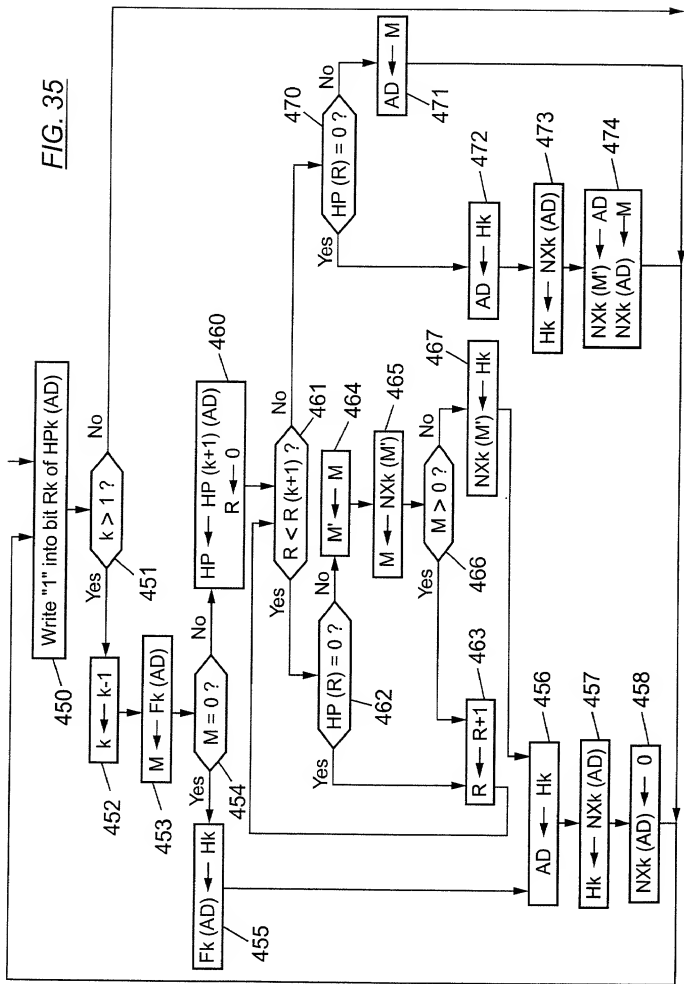
FIG. 34C

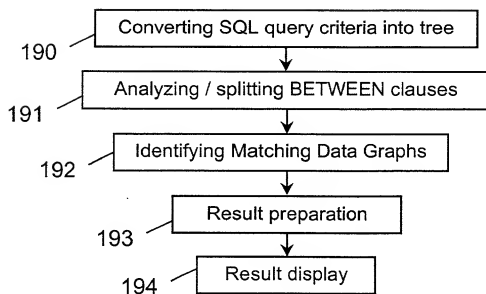
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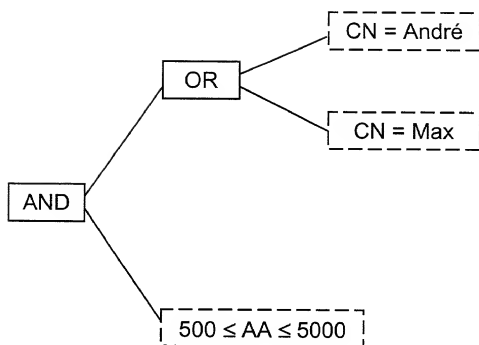
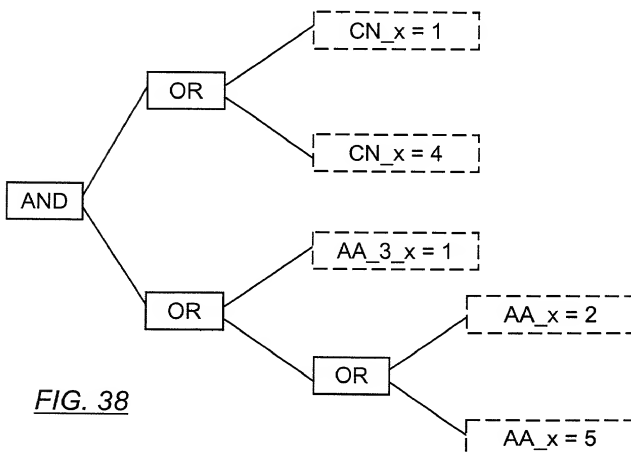
AD	R2	NX1	HP1
1	0	2	100
2	1	0	100
3	0	0	001
4	0	0	010
5	0	0	110
6	1	0	001
7	1	0	010
8	0	0	001
9	0	10	010
10	1	0	100
11	1	0	001
12	1	0	111
13	1	0	010
14	0	0	001
15	0	0	001
16	0	0	100
17	0	0	100
18	1	0	100
19	1	0	001
20	0	0	010
21	0	0	010
22	0	23	001
23	1	0	010
24	0	0	001
25	1	0	100
26	0	0	100
27	1	0	001
28	0	0	010
29	0	0	010
30	x	31	000
31	x	32	000
32	x	33	000
33	x	0	000

FIG. 34D

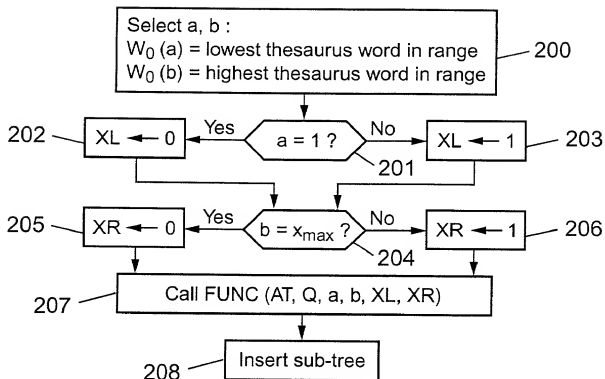
FIG. 35



FIG. 36

FIG. 37FIG. 38

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FIG. 39

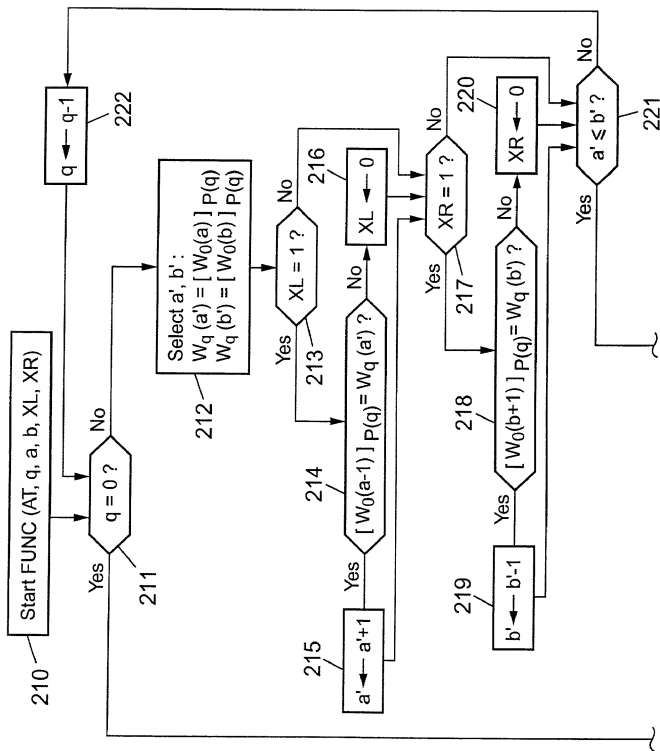
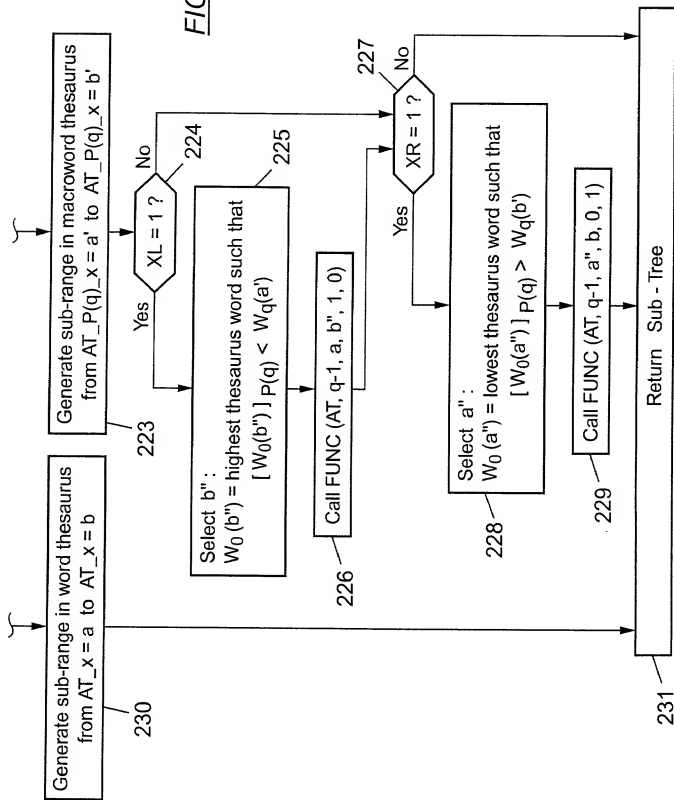


FIG. 40A

FIG. 40B



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FIG. 41

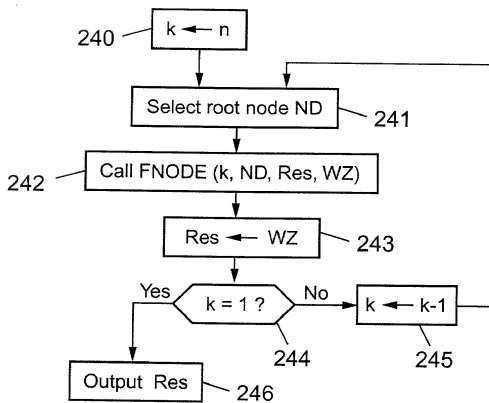


FIG. 43

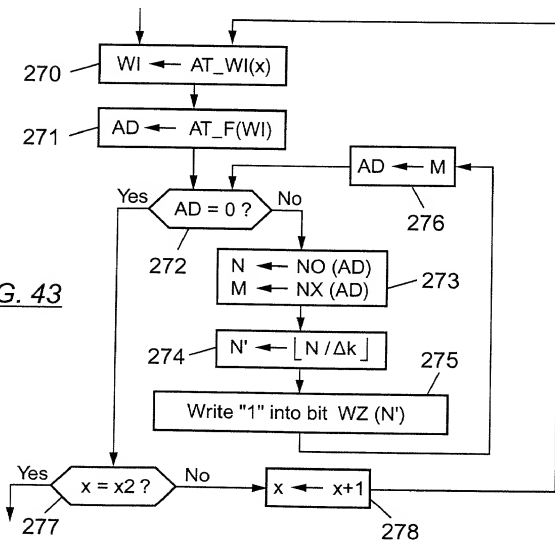
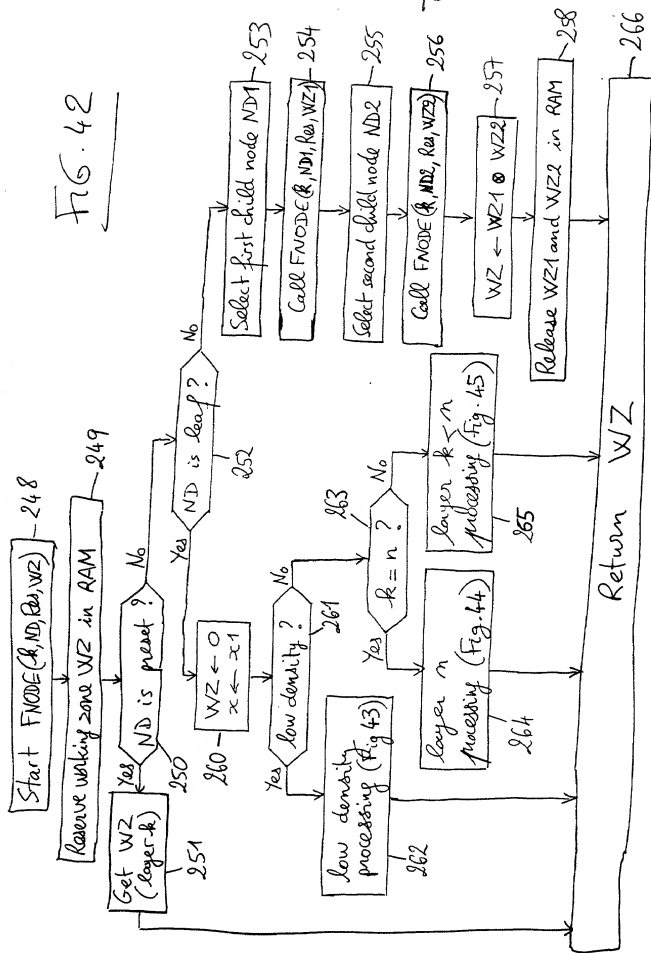
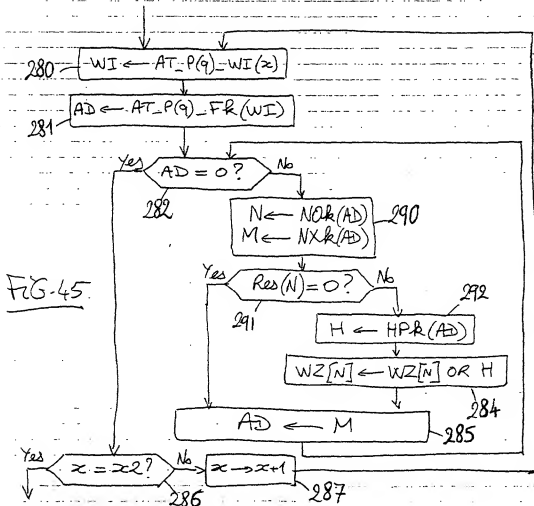
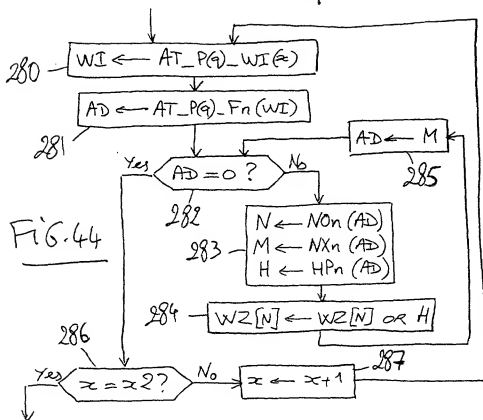


FIG. 42



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279 $TNO \leftarrow -1$ 280 $WI \leftarrow AT - P(q) - WI(x)$ 281 $AD \leftarrow AT - P(q) - FR(WI)$ Yes $AD = 0?$ No

282

 $N \leftarrow NO \& (AD)$ $M \leftarrow NX \& (AD)$

290

Yes $Res(N) = 0?$ No

291

 $TNO(AD) \leftarrow N$

295

285

 $AD \leftarrow M$

FIG. 46

Yes $x = x2?$ No $x \leftarrow x + 1$

286

287

 $AD \leftarrow 1$ 301 $N \leftarrow TNO(AD)$ 302Yes $N = -1?$ No

303

 $H \leftarrow HP \& (AD)$ 304 $WZ[N] \leftarrow WZ[N] \text{ OR } H$

305

Yes $AD = AD_{max}?$ No

306

 $AD \leftarrow AD + 1$

307

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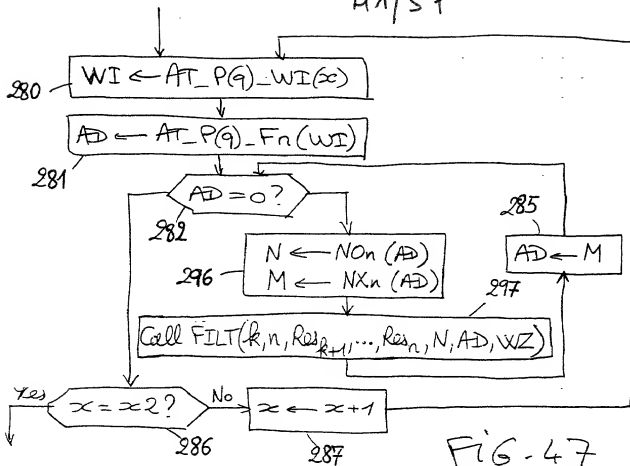


FIG. 47

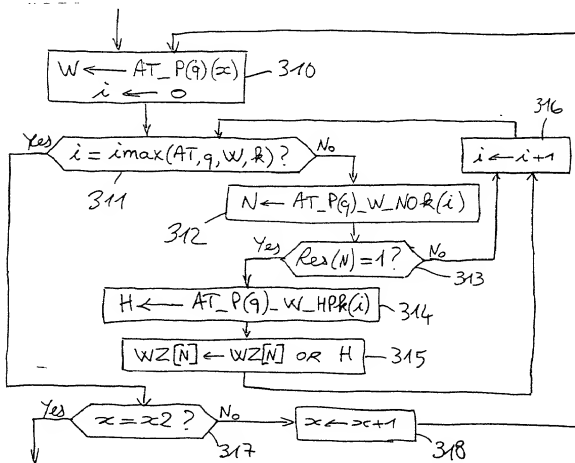


FIG. 49

Start $FILT(R, R', Res_{R+1}, \dots, Res_R, N, AD, WZ)$

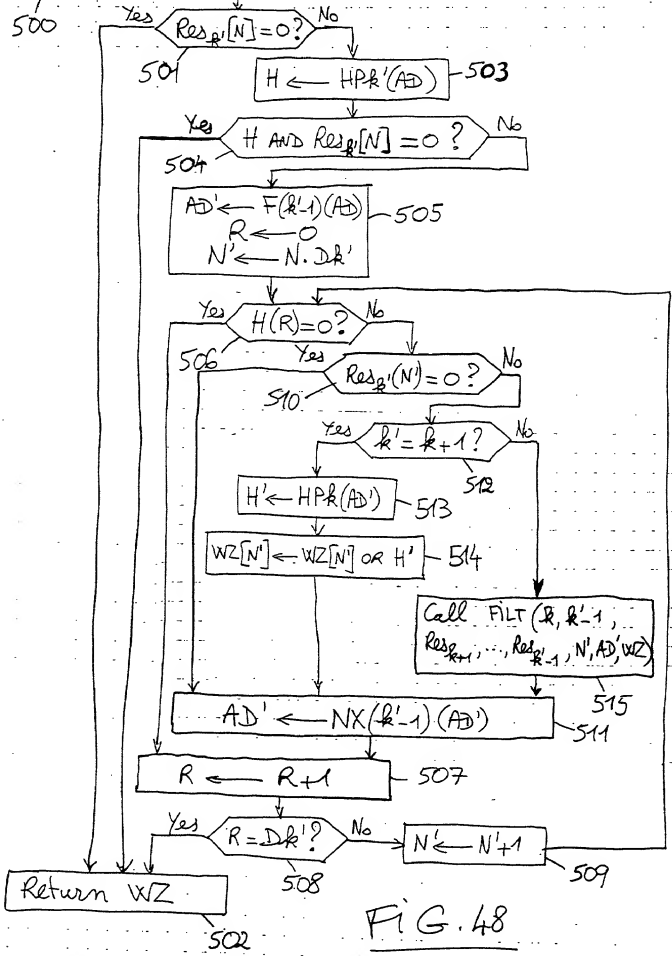


FIG. 48

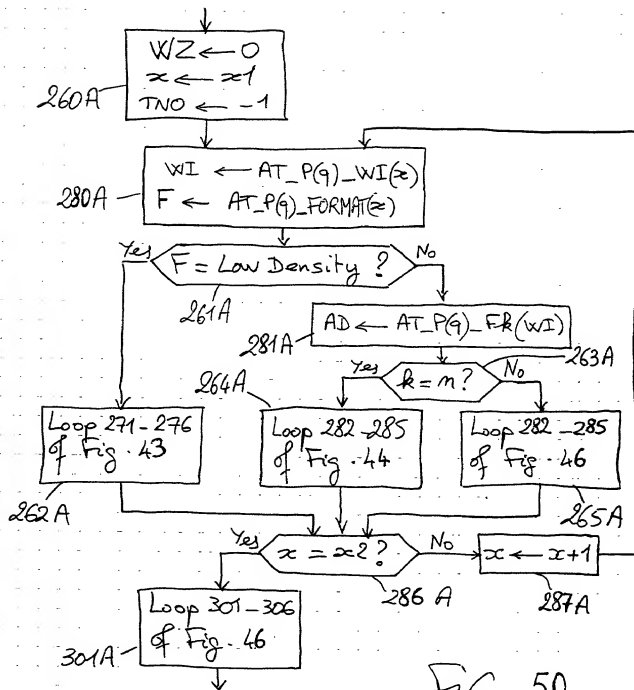


Fig. 50

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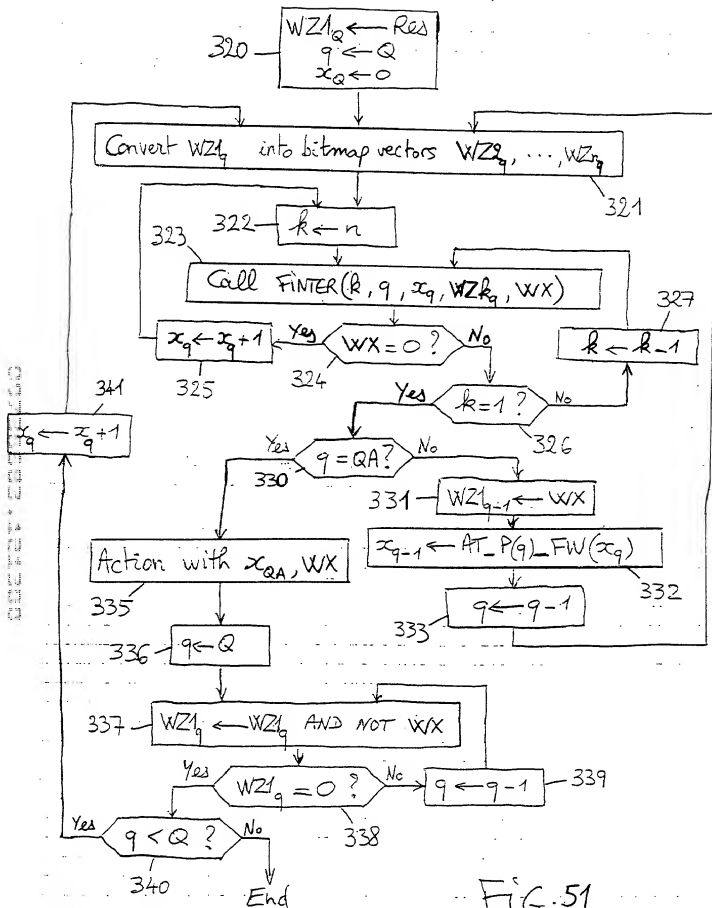


FIG. 51

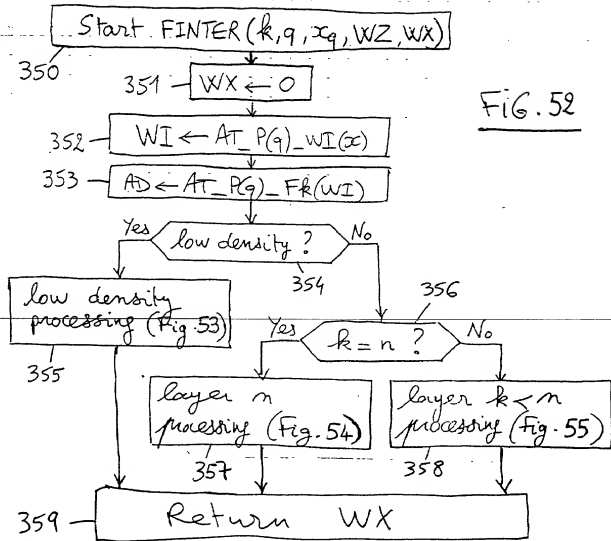


Fig. 52

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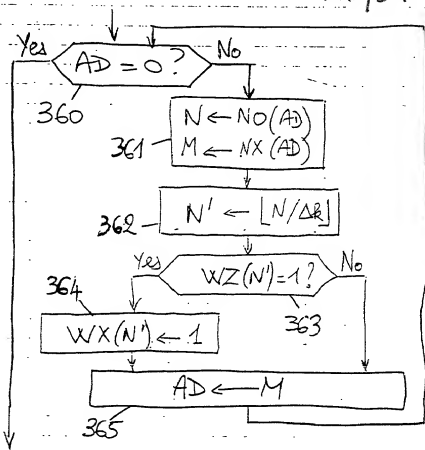


FIG. 53

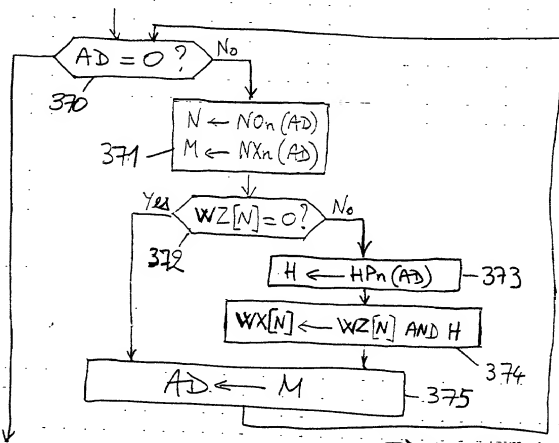


FIG. 54

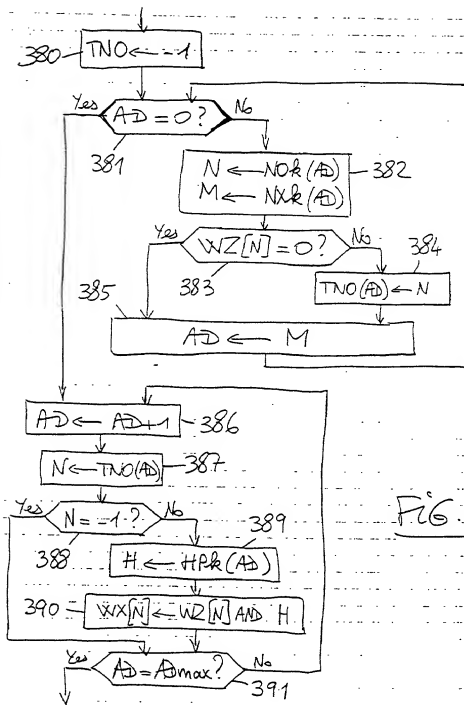


FIG. 55

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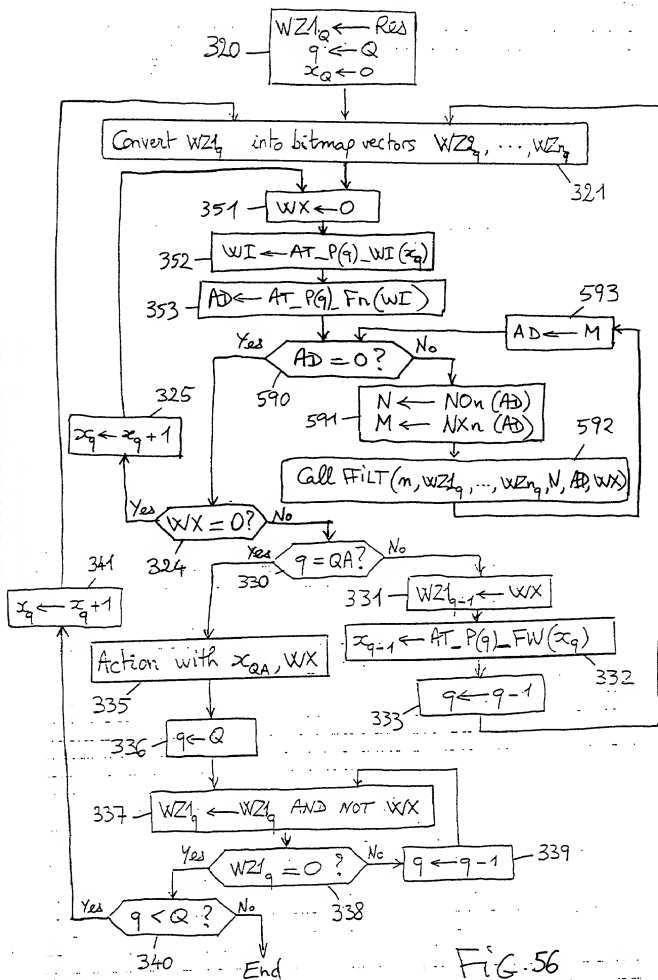


Fig. 56

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Start FFILT($R, WZ_1, \dots, WZ_R, N, AD, WX$)

600

Yes $WZ_R[N] = 0?$ No

601

$H \leftarrow HPR(AD)$ 603

Yes

$H \text{ AND } WZ_R[N] = 0?$ No

604

$AD' \leftarrow F(R-1)(AD)$
 $R \leftarrow 0$
 $N' \leftarrow N \cdot DR$ 605

Yes

$H(R) = 0?$ No

606

Yes

$WZ_R[N'] = 0?$ No

610

Yes

$R = 2?$ No

612

$H' \leftarrow HPI(AD')$ 613

$WX[N'] \leftarrow WZ_1[N'] \text{ AND } H'$ 614

Call FFILT($R-1, WZ_1, \dots, WZ_{R-1}, N', AD', WX$)

$AD' \leftarrow NX(R-1)(AD')$ 615
611

$R \leftarrow R+1$ 607

Yes

$R = DR?$ No

608

$N' \leftarrow N'+1$ 609

Return WX 602

FIG. 57

CLIENT NAME

NO2 F_AD'

0	1
1	5

FIG. 58ACC. AMOUNT

NO2 F_AD'

0	10
1	16

FIG. 59ACC. AMOUNT / 3

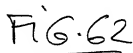
NO2 F_AD'

0	20
1	24

FIG. 60

AD'	HP'2	NX'2	PTR
1	11	2	1
2	10	3	2
3	01	4	3
4	10	0	4
5	10	6	1
6	10	7	2
7	01	8	3
8	11	9	4
9	01	0	5
10	01	11	1
11	10	12	2
12	10	13	3
13	01	14	4
14	01	15	5
15	10	0	7
16	01	17	0
17	10	18	2
18	10	19	3
19	10	0	6
20	11	21	0
21	01	22	1
22	01	23	2
23	10	0	4
24	10	25	0
25	10	26	1
26	10	0	3
27	00	28	x
28	00	29	x
29	00	30	x
30	00	0	x

FIG. 61

$$\frac{1}{\Gamma(\alpha)} \int_0^t (t-\tau)^{\alpha-1} \frac{d}{d\tau} \left(\frac{1}{\Gamma(\beta)} \int_0^\tau (\tau-s)^{\beta-1} \frac{d}{ds} \left(\frac{1}{\Gamma(\gamma)} \int_0^s (s-u)^{\gamma-1} \frac{d}{du} \left(\frac{1}{\Gamma(\delta)} \int_0^u (u-v)^{\delta-1} \frac{d}{dv} f(v) dv \right) du \right) ds \right) d\tau$$


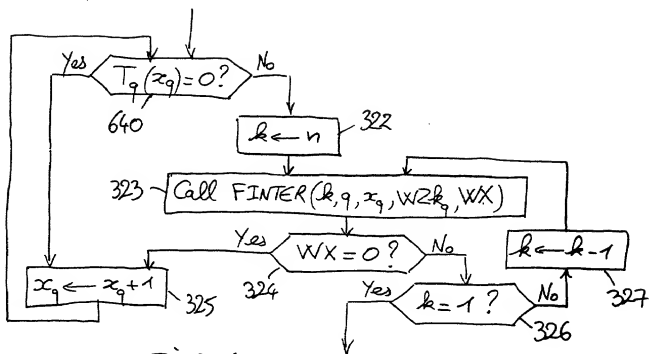


FIG. 63

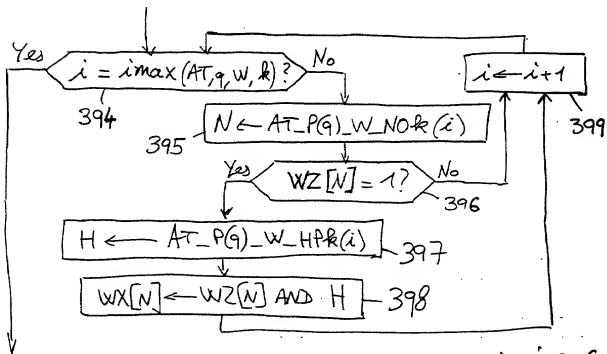
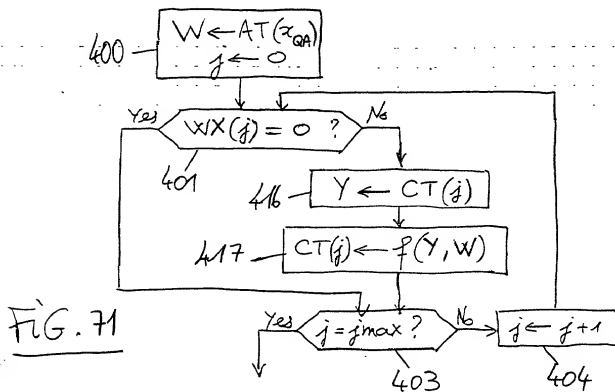
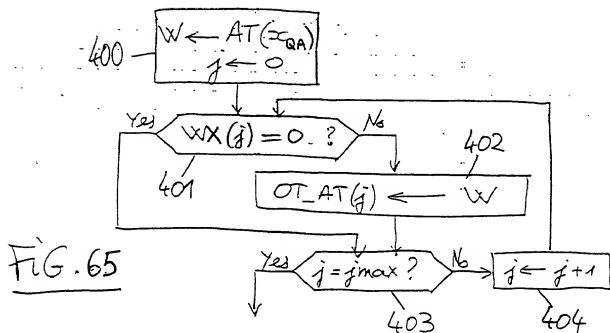


FIG. 64



OUTPUT TABLE

Flat File Row-ID Acc. Date Client Name Policy Date

0	1998 10 03	André	1998 09 09
1	/	/	/
2	1999 04 18	Max	1999 01 10
3	1999 06 12	André	1998 09 09
4	/	/	/
5	/	/	/
6	/	/	/
7	/	/	/
8	2000 03 20	André	1998 09 09
9	/	/	/
10	/	/	/
11	/	/	/

FIG. 66OUTPUT TABLE

Flat File Row-ID Acc. Date Client Name Policy Date

0	1	1	2
1	/	/	/
2	2	4	4
3	3	1	2
4	/	/	/
5	/	/	/
6	/	/	/
7	/	/	/
8	8	1	2
9	/	/	/
10	/	/	/
11	/	/	/

FIG. 67

INDEX

Flat File Row-ID

0	0
1	/
2	1
3	2
4	/
5	/
6	/
7	/
8	3
9	/
10	/
11	/

OUTPUT TABLE

Row-ID	Acc. Date	Client Name	Policy Date
0	1	1	2
1	2	4	4
2	3	1	2
3	8	1	2

FIG. 68

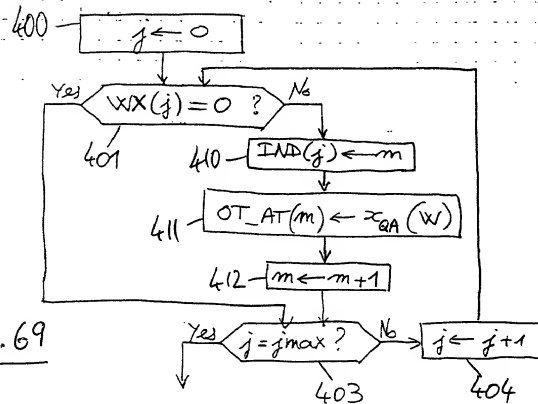


FIG. 69

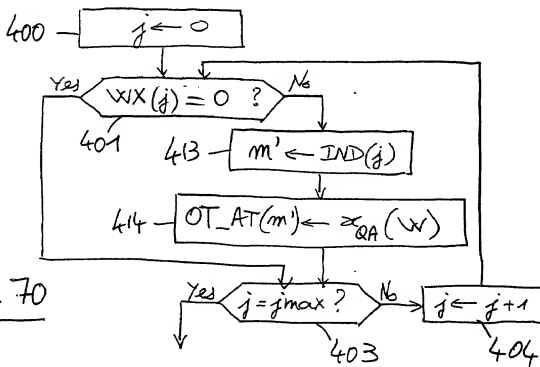


FIG. 70

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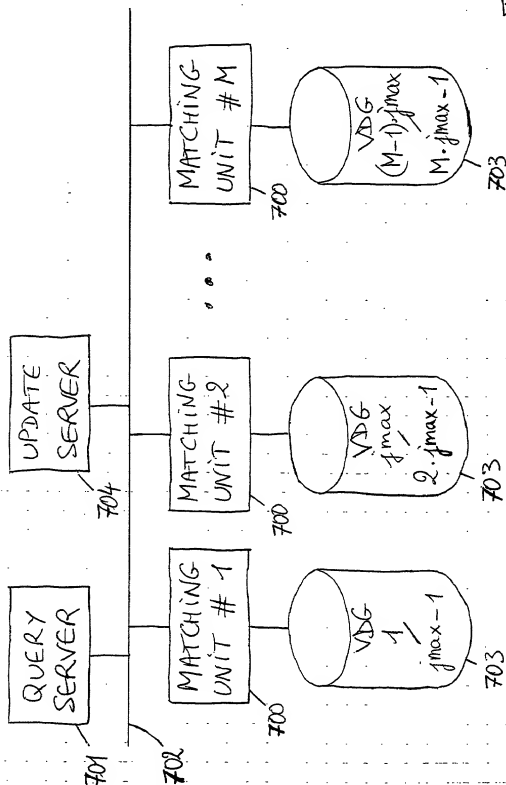


FIG. 72